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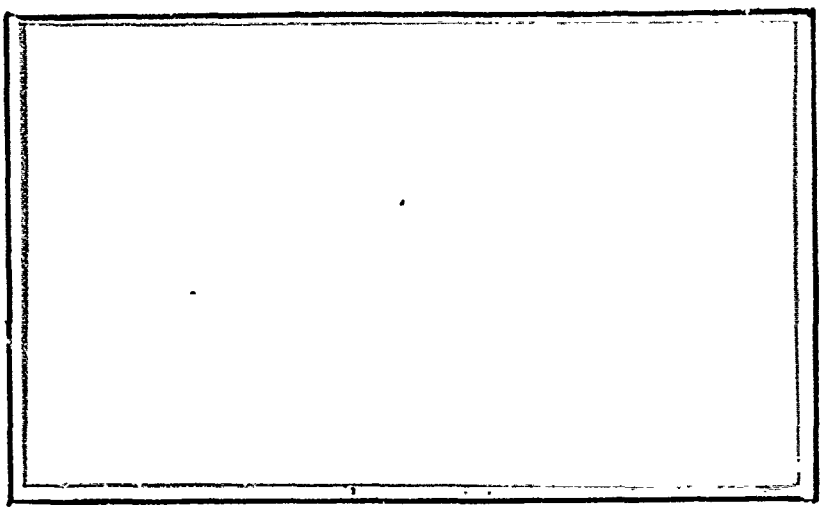
MOST Project - 4

LEVEL II



TECHNICAL MEMORANDUM

U.S. NAVAL APPLIED SCIENCE LABORATORY
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USNASL-9110-P-IJ

LEVEL II

(1)

MOST Project

(6) DEVELOPMENT OF ADDITIONAL REQUIREMENTS FOR INCLUSION IN MILITARY SPECIFICATION, SPRAYABLE VIBRATION DAMPING MATERIAL FOR SURFACE VESSELS.
(Similar to NAVAPLSCIENLAB Formulation ML-SD15)

(17) SF 013 13 01 Task 908

Lab. Project 9300-16, Technical Memorandum #7

Bureau Identification No. 21-908-2

(11) 5 AUG 1964

(9) Technical memo.

MATERIAL SCIENCES DIVISION

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U. S. NAVAL APPLIED SCIENCE LABORATORY
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Ref: (a) BUSHIPS ltr F013-13-01, Ser 634C1-441 of 9 May 1962
(b) NAVAPLSCIENLAB Lab. Project 9300-16, Tech Memo #5 of 17 Mar 1964
(c) FONECON between Messrs. D. Pratt and W. Bourn (BUSHIPS, Code 634C1) and H. P. Edelstein and A. W. Cizek, Jr. (NAVAPLSCIENLAB, Code 9370) on 16 Dec 1963
(d) Conference held at BUSHIPS with Codes 634C1, 634A, 345A and 688E and H. P. Edelstein (NAVAPLSCIENLAB, Code 9370) on 23 and 24 Jan 1964
(e) FONECON between Messrs. D. Pratt and W. Bourn (BUSHIPS, Code 634C1) and H. P. Edelstein and A. W. Cizek, Jr. (NAVAPLSCIENLAB, Code 9370) on 28 Jan 1963
(f) FONECON between W. Bourn (BUSHIPS, Code 634C1) and H. P. Edelstein (NAVAPLSCIENLAB, Code 9370) on 3 Feb 1964
(g) Conference held at BUSHIPS with Messrs. D. Pratt and W. Bourn, Code 634C1 and H. P. Edelstein (NAVAPLSCIENLAB, Code 9370) on 19 and 20 Feb 1964
(h) BUSHIPS Spdltr DDR880/9390, Ser 634A-279 of 30 Mar 1964
(i) COMNAVSHIPYD BSN ltr (231) DD880 of 1 May 1964

Encl: (1) Amendment to Military Specification, Sprayable Vibration Damping Material for Surface Vessels, Proposed in NAVAPLSCIENLAB Lab. Project 9300-16, Technical Memorandum #5 of 17 Mar 1964 (4 pgs)

1. INTRODUCTION

a. The development program on sonar dome and hull plate damping for surface vessels, authorized in reference (a), is continuing at the U. S. Naval Applied Science Laboratory.

b. This report deals specifically with the development of additional requirements for inclusion in the proposed performance specification for a sprayable vibration damping material for surface vessels previously forwarded under reference (b). This specification was based on the Laboratory-developed ML-SD15 formulation.

2. BACKGROUND

a. In reference (c), the Bureau of Ships requested that the Laboratory prepare a performance specification for procuring sprayable vibration damping materials conforming to the characteristics of the ML-SD15 formulation, for application to the interior metal surfaces of sonar domes.

b. On the occasion of reference (d), at which time labboratory data and specification and qualified products list requirements were discussed, the Bureau requested that the scope of the proposed specification be changed to specify

application of the sprayable damping material to include other floodable voids, such as fuel tanks, and non-floodable areas of surface vessels where ML-D2 damping tiles are currently being used. In view of the fact that this change required additional test work and because the portion of the specification dealing with the sonar dome material was urgently required, it was agreed, and confirmed in references (e) and (f), to first issue the sonar dome portion of the specification. Subsequently, when the additional data became available, the Laboratory would issue amendments to the specification to include requirements for the fuel tanks and non-floodable areas of surface vessels, as indicated in paragraph 2c of reference (b).

c. Accordingly, in reference (b), the Laboratory submitted the inital phase of the work assignment, by developing a performance specification for sprayable vibration damping materials, conforming to the characteristics of the Laboratory-developed ML-SD15 formulation, for application to sonar domes and floodable voids, such as ballast tanks, of surface vessels.

3. FURTHER SPECIFICATION DEVELOPMENT

a. As agreed upon in references (e) and (f), the Laboratory has developed additional requirements for inclusion in the performance specification for sprayable vibration damping materials, reference (b), for surface vessel applications. These requirements are forwarded herewith as enclosure (1).

b. The inclusion of these requirements in the specification will permit application of sprayable vibration damping materials, conforming to the characteristics of the Laboratory-developed ML-SD formulation, to the following surface vessel areas:

(1) Floodable voids such as sonar domes and ballast tanks.

(2) Non-floodable voids such as machinery, storage, and living spaces.

(3) Fuel oil tanks.

4. QUALIFICATION

a. On the occasion of reference (g), the Laboratory was requested to submit the names of any manufacturers who could be approved for listing on a Qualified Products List.

b. During the course of developing packaging, mixing, and spraying techniques for the ML-SD15 formulation and the preparation of numerous test specimens, the Laboratory found it expedient to have a resin formulator, Philadelphia

Resins Company, Incorporated, 7637 Queen Street, Philadelphia 18, Pennsylvania, to assist in accomplishing these tasks. At the request of the Laboratory, specimens were prepared by this manufacturer in accordance with the requirements of the proposed specification, reference (b), and the additional requirements included in this report, enclosure (1). All specimens were found to conform to the test requirements of reference (b) and enclosure (1), and these results will be forwarded to the Bureau in the near future. Therefore, it is recommended that the Philadelphia Resins Company, Incorporated be approved for inclusion on the proposed Qualified Products List, both as a supplier and applicator of the ML-SD15 vibration damping material, both for shipboard spaces and for sonar domes of surface vessels.

5. TRIAL INSTALLATION

a. In reference (h), the Boston Naval Shipyard was directed to proceed with a trial application of approximately 4,000 square feet of the sprayable ML-SD15 vibration damping material, in lieu of ML-D2 tiles, on the USS DYESS (DD880). It was further directed that the application would be made by shipyard personnel and that the necessary damping material, spray equipment, and technical assistance be supplied by the Philadelphia Resins Company, Incorporated.

b. In reference (i), the Boston Naval Shipyard indicated that the application would commence on or about 6 July 1964 and would be completed in approximately 3 weeks. It is anticipated that representatives of the Bureau of Ships (Code 634A and 634C1) and the U. S. Naval Applied Science Laboratory (Code 9370) will be present intermittently during the 3 week period to witness the application and provide technical assistance.

6. FUTURE WORK

Future work in this program, directed toward further reducing sonar self-noise to increase sonar capability, will include:

a. Development of means of improving spraying equipment to provide more rapid rate of application of ML-SD15 formulation to surface vessels.

b. Study of the characteristics of the ML-SD15 formulation under conditions of submergence pressures encountered by submarines for possible application in their ballast tanks and sails, and development of more suitable materials.

c. Development of acoustically transparent damping materials in order to completely cover the interior sonar dome surface without restricting sound transmission.

MILITARY SPECIFICATION

SPRAYABLE VIBRATION DAMPING MATERIAL FOR SURFACE VESSELS

This amendment forms a part of Military Specification proposed in NAVAPLSCIENLAB Lab. Project 9300-16, Technical Memorandum #5 of 17 Mar 1964

Page 1, paragraph 2.1: Add after Specifications:

"Federal

TT-P-645 - Primer, Paint, Zinc-Chromate, Alkyd Type"

Page 1, paragraph 2.1: Add after Specifications, Military:

"MIL-J-5624F - Jet Fuel, Grades JP-4 and JP-5

MIL-P-23236 - Paint Coating Systems, Steel Ship Tank, Fuel and Salt Water Ballast

Page 2, paragraph 3.3, second sentence: Delete and substitute "Unless otherwise specified, no more than three coats shall be required for vertical and horizontal surface applications and no more than five coats for overhead applications."

Page 3, paragraph 3.7: Delete and substitute:

"3.7 Weight. - Unless otherwise specified, the average weight of the sprayed damping material shall be 4.5 ± 0.2 pounds per square foot (psf), when determined as specified in 4.7.3."

Page 3, paragraph 3.12: Delete and substitute:

"3.12 Fuel and water resistance. - When tested as specified in 4.7.7, the damping material shall comply with the requirements listed in Table 1."

Page 4, Table 1: Delete and substitute:

"Table 1 - Fuel and water resistance

Average gain in weight, percent (maximum) (1)	
JP-5 Fuel	Water
1.0	1.0

Note: (1) Loss in weight and/or alligatoring, cracking, peeling, or blistering of the protective or anti-fouling coatings from the damping material shall constitute non-conformity."

Page 7, paragraph 4.6: Add after Water resistance:

"Fuel resistance 4.7.7"

Page 8, paragraph 4.7.1: Delete and substitute:

"4.7.1 Preparation of specimens. - Specimens of the sizes as specified in in the following tests shall be made by preparing the damping material in accordance with the manufacturer's instructions. The damping material shall be sprayed on sandblasted mild steel plates and discs supported in a vertical position, to a nominal thickness of 5/8 inch. For the specific tests, flame retardance and immersion, where no steel plates and discs are required, the damping material shall be sprayed to a 5/8 inch thickness in molds, supported in a vertical position, which have been prepared with a suitable release agent. The steel plates and discs shall be of a thickness specified by the test. Unless otherwise specified (see 4.7.1.2), no more than three coats shall be required for the 5/8 inch damping material thickness. Before application of the damping material, the steel plates and discs shall be coated with the appropriate priming system, depending on the specific intended use of the material, as follows:

(a) Floodable voids. -

Where the damping material is to be applied in floodable voids such as sonar domes and salt water ballast tanks, the steel plates and discs shall receive one coat of formula 117 pretreatment coating (MIL-P-15328) and four coats of formula 119 red lead vinyl primer (MIL-P-15929), prior to the spraying of the material.

(b) Non-floodable voids. -

Where the damping material is to be applied in non-floodable voids such as machinery, storage and living spaces, the steel plates and discs shall receive one coat of formula 117 pretreatment coating (MIL-P-15328) and two coats of formula 84 zinc-chromate primer (TT-P-645), prior to the spraying of the material.

(c) Fuel oil tanks. -

Where the damping material is to be applied in fuel oil tanks, the steel plates and discs shall receive either a Type I, Class 1 or Type I, Class 3 priming system (MIL-P-23236), prior to the spraying of the material.

4.7.1.1 It is required that for all test specimens the damping material shall be oversprayed with two coats of an epoxy protective coating (see 6.5). In addition, where the material is for sonar dome application, two coats of formula 121 red vinyl anti-fouling coating (MIL-P-15931) shall be sprayed over the epoxy protective coating.

4.7.1.2 Where the damping material is to be applied in fuel oil tanks, it is required that the specimens be sprayed with a fourth 1/8 inch thick coat. Immediately after its application, the last coat shall be troweled smooth.

4.7.1.3 The specimens as prepared in 4.7.1, 4.7.1.1 and 4.7.1.2 shall be allowed to cure for 7 days before conducting tests. Unless otherwise specified, all conditioning and testing shall be conducted at 23 ± 1.1°C (73.5 ± 2°F) and 50 ± 2 per cent relative humidity."

Page 10, paragraph 4.7.7: Delete and substitute:

"4.7.7 Fuel and water resistance. - Six specimens, each measuring 1 inch by 3 inches, shall be prepared as specified in 4.7.1. Three coated samples shall be immersed in JP-5 jet fuel that meets the requirements of Specification MIL-J-5624F and three coated samples shall be immersed in distilled water. At least 1 liter of the test fluid shall be employed and each specimen shall be isolated so that surfaces are exposed and immersion is complete. The samples shall be weighed to the nearest 0.01 gram prior to immersion. Immersion shall continue at 23 ± 1.1°C (73.5 ± 2°F) for 168 ± 1 hours. Upon completion of this period, specimens shall be removed from the immersion medium, individually, excess fluid shall be wiped off with a paper towel and the sample shall be weighed again, immediately. Per cent weight change shall be computed from the following equation:

$$\text{Per cent weight change} = \frac{\text{Final-initial weight}}{\text{initial weight}} \times 100$$

Test results of the three individual specimens for a given immersion medium shall be averaged. The material shall also be examined for alligatoring, cracking, peeling or blistering of the protective or anti-fouling coating".

Page 14, paragraph 6.1: Delete and substitute:

"6.1 Intended use. - The vibration damping material covered by this specification is intended for general use in sonar domes, ballast tanks, and machinery, storage and living spaces. It may be used for fuel oil tank applications providing the material is top-coated with a final troweled application of damping material to smooth out the irregular surface, thereby simplifying subsequent cleaning operations. The damping material shall be sprayed over metal surfaces pretreated with primer coatings (see 4.7.1). Unless otherwise specified, the damping material shall be oversprayed with an epoxy protective coating and, where requried, with a vinyl anti-fouling paint (see 4.7.1.1)".